



PEICAI SECONDARY SCHOOL

SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC

PRELIMINARY EXAMINATION 2026

CANDIDATE
NAME

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CLASS

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REGISTER NUMBER

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MATHEMATICS

Paper 2

4052/02

19 August 2026

2 hours 15 minutes

Candidates answer on Question Paper

READ THESE INSTRUCTIONS FIRST

Write your register number, class and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

Answer **all** questions.

If working is needed for any question it must be shown with the answer.

Omission of essential working will result in loss of marks.

The use of an approved scientific calculator is expected, where appropriate.

If the degree of accuracy is not specified in the question, and if the answer is not exact, give the answer to three significant figures. Give answers in degrees to one decimal place.

For π , use either your calculator value or 3.142, unless the question requires the answer in terms of π .

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 90.

For Examiner's Use

This document consists of **22** printed pages and **2** blank pages.

Setter: Ms Novell Tham

[Turn over

Mathematical Formulae*Compound Interest*

$$\text{Total Amount} = P \left(1 + \frac{r}{100} \right)^n$$

Mensuration

$$\text{Curved surface area of a cone} = \pi r l$$

$$\text{Surface area of a sphere} = 4\pi r^2$$

$$\text{Volume of a cone} = \frac{1}{3} \pi r^2 h$$

$$\text{Volume of a sphere} = \frac{4}{3} \pi r^3$$

$$\text{Area of triangle } ABC = \frac{1}{2} ab \sin C$$

$$\text{Arc length} = r\theta, \text{ where } \theta \text{ is in radians}$$

$$\text{Sector area} = \frac{1}{2} r^2 \theta, \text{ where } \theta \text{ is in radians}$$

Trigonometry

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

Statistics

$$\text{Mean} = \frac{\sum fx}{\sum f}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum fx^2}{\sum f} - \left(\frac{\sum fx}{\sum f} \right)^2}$$

Answer **all** questions

- 1 (a) Find all the prime numbers that satisfy the inequality $-3 < \frac{x-1}{6} \leq \frac{1}{2}$.

Answer [3]

(b) Simplify $\frac{6xy^4}{5z^5} \div \frac{9x^3z}{20y^3}$.

Answer [2]

(c) Simplify $\left(\frac{\sqrt[4]{r^{12}}}{27s^9} \right)^{-\frac{1}{3}}$.

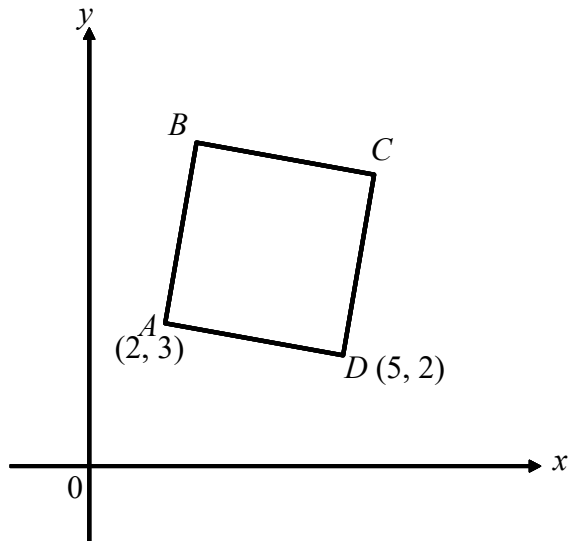
Answer [2]

[Turn over

(d) Write as a single fraction in its simplest form $\frac{7}{25x^2-4} - \frac{3}{2-5x} + 1$.

Answer [4]

2



- (a) In the diagram, $ABCD$ is a square. The coordinates of A and D are $(2, 3)$ and $(5, 2)$ respectively. Find the area of square $ABCD$.

Answerunits² [3]

[Turn over

- (b) The points $M(0, 2k)$, $N(1, k)$ and $P(5, -6)$ lie on the same straight line.
(i) Show that the value k is 2.

Answer

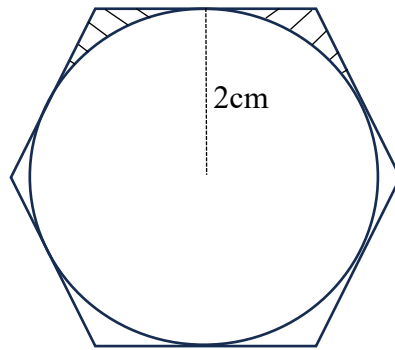
[2]

- (ii) Find the equation of MN .

Answer [2]

[Turn over

- 3 The diagram below shows a circle of radius 2 cm inscribed in a regular hexagon.



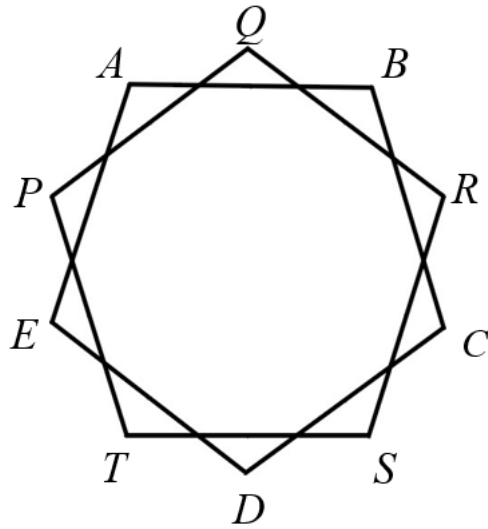
- (a) (i) Show that the length of one side of the hexagon is 2.31cm
Answer

[2]

- (ii) Find the area of the shaded region.

Answercm² [3]

- (b) Two regular pentagons $ABCDE$ and $PQRST$ are joined together to form the shape shown below.

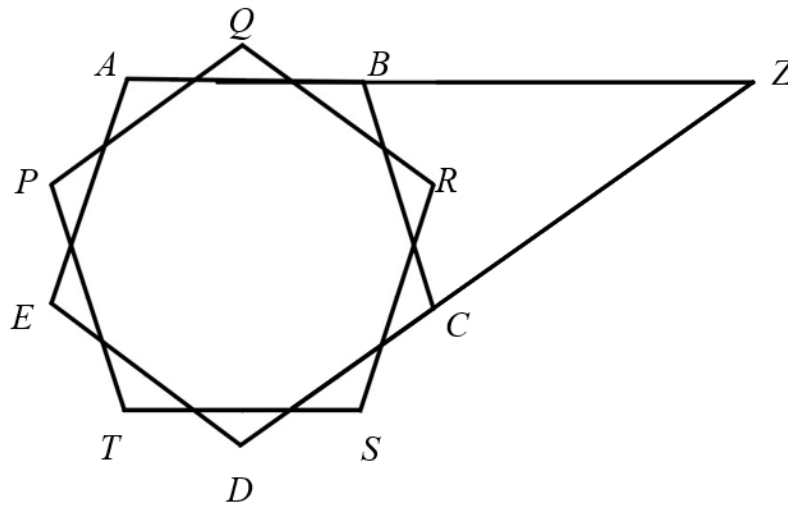


Find angle AEC .

Answer $^{\circ}$ [3]

[Turn over

- (c) The sides CD and AB are produced to meet at Z . Show that triangle BZC is an isosceles triangle.



Answer

[3]

[Turn over

- 4 The table below shows the distribution of three types of apartments in three blocks of an Executive Condominium.

	3-room	4-room	5-room
Block 1	25	20	60
Block 2	35	45	30
Block 3	30	50	10

This information can be represented by the matrix $\mathbf{A} = \begin{pmatrix} 25 & 20 & 60 \\ 35 & 45 & 30 \\ 30 & 50 & 10 \end{pmatrix}$.

The areas of the 3-room, 4-room and 5-room apartments are 75 m², 95 m² and 120 m² respectively.

- (i) Represent the areas of the apartments in a 3×1 column matrix $\mathbf{C}$.

Answer $\mathbf{C} =$ [1]

- (ii) Evaluate the matrix $\mathbf{M} = \mathbf{AC}$

Answer $\mathbf{M} =$ [2]

- (iii) State what the elements of $\mathbf{M}$ represent.

Answer

[1]

[Turn over

- (iv) Estate management fees are charged based on the floor area of the apartments in the three blocks per quarter. The estate management fee rates is \$15/m² per quarter. Find the total amount of estate management fee collected in a year for the Executive Condominium.

Answer \$..... [3]

- (v) The total estate management fee collected in one year for the Executive Condominium is used in the following areas.

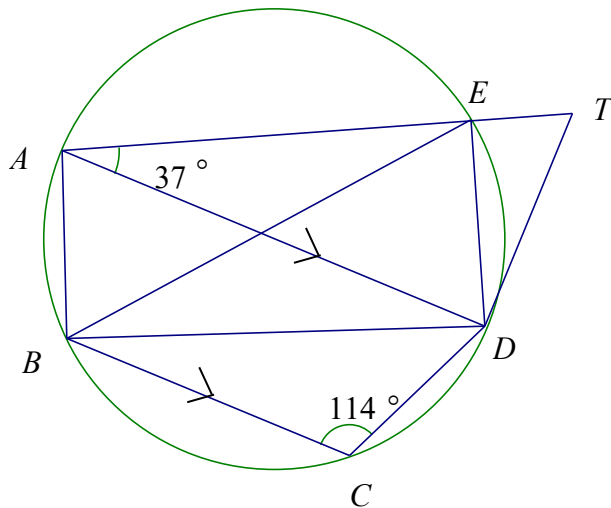
Areas	Amount
Day-to-day operating expenses	25% of the total amount collected
Cleaning	$\frac{1}{5}$ of the total amount collected
Security guards	\$2350 per month for each security guard. The estate has 2 security guards.
Landscaping	\$50 000 per year
Electricity for common areas	\$120 000 per year

The remaining amount is transferred to the sinking fund, which is used for future major repairs and replacement of shared facilities.
Calculate the amount transferred to the sinking fund.

Answer \$..... [4]

[Turn over

5



The points A , B , C , D and E lie on the circle. AD is the diameter of the circle, DT is a tangent to the circle, AET is a straight line and AD is parallel to BC . Angle $BCD = 114^\circ$ and angle $DAE = 37^\circ$.

(a) Find angle EBC .

Give a reason for each step of your working.

.....

[4]

(b) Emily claims that quadrilateral $AEDB$ is a parallelogram.

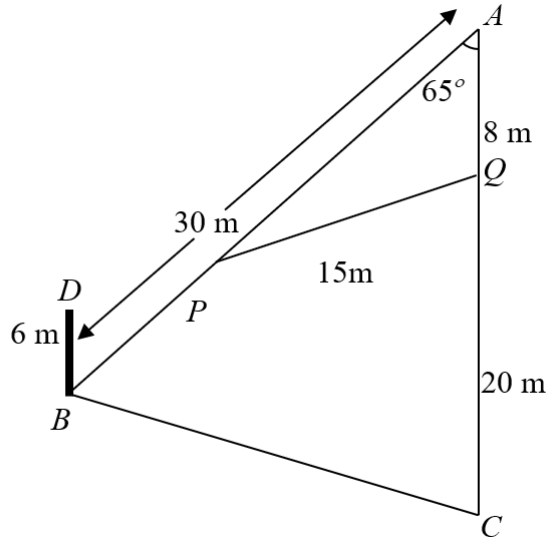
Do you agree with her claim?

Give a reason for each step of your working.

.....

[3]

6



A landscape architect is designing a new park as shown in the diagram above. The straight road AC runs due north-south. Point B is an existing entrance to the park. Point P is a proposed rest area on path AB . Point Q is a water point on road AC .

Given that $AQ = 8$ m, $QC = 20$ m, $AB = 30$ m, $PQ = 15$ m and angle $PAQ = 65^\circ$.

(a) Calculate bearing of B from A .

Answer $^\circ$ [1]

(b) Find the length of the footpath BC .

Answerm [2]

[Turn over

- (c) The shortest footpath from P to road AC is to be constructed. Find the length of the shortest footpath.

Answerm [4]

- (d) A lamp post BD , 6 m tall, is to be installed vertically at point B .

Calculate the angle of elevation of the top of the lamp post, D , from point C .

Answer° [2]

[Turn over

7. The map below shows the driving distances from Singapore to different parts of Malaysia.



Adapted from <https://www.tourradar.com/t/218274>

Jonathan drove from Singapore to Kuala Lumpur and then returned from Kuala Lumpur to Singapore during the June holidays. Some details of his average speed are shown below.

Journey	Average Speed
Singapore to Kuala Lumpur	x km/h
Kuala Lumpur to Singapore	10 km/h more than the journey from Singapore to Kuala Lumpur

- (a) Write down, in terms of x , the time taken for the journey from Singapore to Kuala Lumpur.

Answerh [1]

- (b) Given that the difference in time taken for the two journeys was 24 minutes, form an equation in x and show that it reduces to $x^2 + 10x - 9000 = 0$.

Answer

[3]

[Turn over

- (c) Solve the equation $x^2 + 10x - 9000 = 0$ and find the average speed for the journey from Singapore to Kuala Lumpur.

Answerkm/h [2]

- (d) Jonathan set off at 9:45pm on Tuesday for his return journey from Kuala Lumpur to Singapore. Find the day and time he reached home, give your answer correct to the nearest minute.

Answer Jonathan reached home on..... and the time is[3]

- (e) The speed limit and penalties for speeding on Singapore expressways are shown below.

SINGAPORE EXPRESSWAY SPEED LIMIT & SPEEDING PENALTIES

SPEED LIMITS ON EXPRESSWAYS



90 km/h

Most expressways

- PIE
- KPE
- AYE
- SLE
- TPE
- ECP



80 km/h

Certain stretches with higher risk

- Tunnels
- Sharp bends
- Roadworks
- Other hazardous sections

 Always adhere to the speed limit on the electronic signboards and road signs as it may vary along the expressway.

 Any speed above the posted limit is an offence. There is **no official speed allowance**.

SPEEDING PENALTIES (EFFECTIVE 1 JAN 2026)

EXCEEDING SPEED LIMIT BY	DEMERIT POINTS	FINE / ACTION (LIGHT VEHICLE)
Up to 20 km/h	6 points	\$200
> 20 – 30 km/h	8 points	\$300
> 30 – 40 km/h	12 points	\$400
> 40 – 50 km/h	18 points	Court Prosecution
> 50 km/h	24 points	Court Prosecution and possible licence suspension / disqualification

IMPORTANT NOTES

- Demerit points are accumulated within 12 months.
- Accumulating 24 demerit points within 12 months will result in licence suspension.
- Demerit points will be reduced after 12 months from the date of the offence, provided no further demerit points are incurred.

Jonathan claims that he did not exceed the speed limit during his return journey. Do you agree with Jonathan's claim? Justify your answer using the information provided. State the fine and the number of demerit points, if any, that Jonathan would receive.

Answer

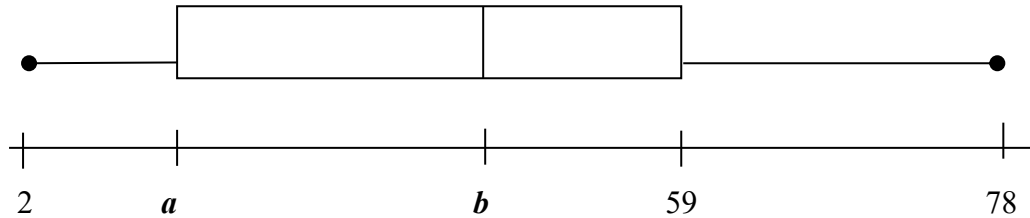
[2]

[Turn over

8 (a) The ages of 15 people are recorded below.

46 2 8 6 41 47 59 43 59 65 78 55 39 48 60

A box-and-whisker diagram is drawn to represent the data.



(i) Find the values of a and b .

Answer $a = \dots\dots\dots$ and $b = \dots\dots\dots$ [2]

(ii) Calculate

(a) the mean of the ages.

Answer $\dots\dots\dots$ [1]

(b) the standard deviation of the ages.

Answer $\dots\dots\dots$ [1]

(b) Explain why the mean may not be an appropriate average for this data set.
State a more appropriate measure of average.

Answer $\dots\dots\dots$

$\dots\dots\dots$ [2]

[Turn over

9. The first few lines of a number sequence are:

$$1^2 + 0^2 = 1$$

$$2^2 + 1^2 = 5$$

$$3^2 + 2^2 = 13$$

$$4^2 + 3^2 = 25$$

- (a) Write down the 10th line.

Answer [1]

- (b) Write down in the simplest form, the n th line, in terms of n .

Answer [2]

- (c) One of the lines in the sequence is

$$x^2 + y^2 = 2521.$$

Find the values of x and y .

Answer $x =$, $y =$ [4]

[Turn over

10. The Singapore Government aims to increase the use of Electric Vehicles (EVs) to reduce carbon emissions. One way of encouraging EV ownership is by installing more public charging stations across the island.

The table below shows the approximate number of public EV charging stations at the end of each year.

Years after 2020, x	1	2	3	4	5
Number of charging stations, y	2200	2600	3100	3700	4500

- (a) On the grid provided, plot the points given in the table and join them to form a smooth curve. [2]

- (b) Four students suggest different mathematical models for the graph.

Student	Model
A	$y = ax + b$
B	$y = ax^2 + b$
C	$y = a\sqrt{x} + b$
D	$y = ab^x$

State which student's model best represents the graph.
Give one reason for your choice.

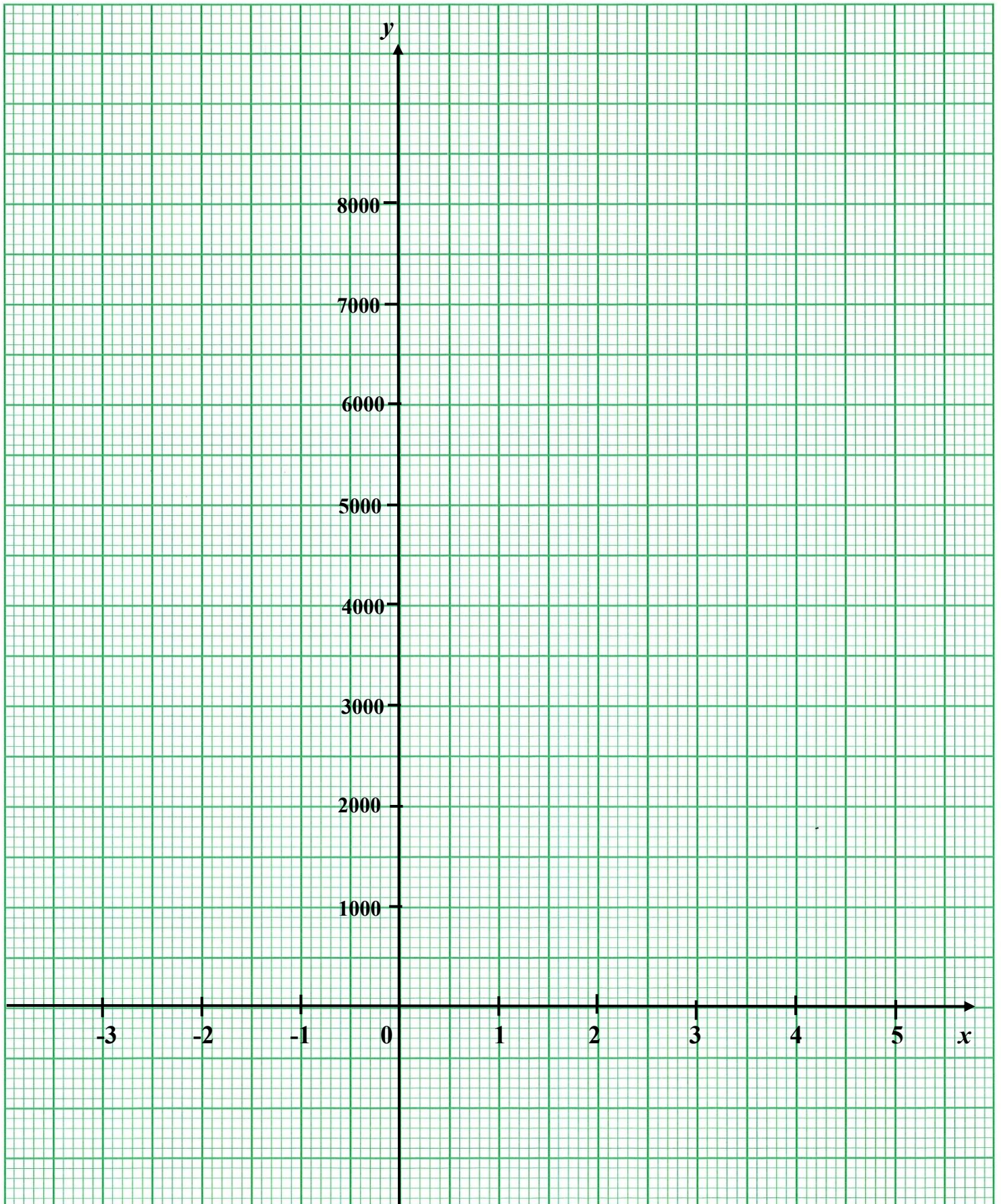
Answer

[2]

[Turn over

- (c) In 2030, the Land Transport Authority announces a target of 13 000 charging stations. Based on your model, comment on whether this target is likely to be achieved. You are required to show all mathematical calculations clearly and state any assumptions you have made.

Answer for 10a



[Turn over

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